

REMARKS

By the present amendment, Claims 5 and 17 have been amended, and Claims 1-4 and 13-16 have been canceled. Claims 5-12 and 17-24 remain pending in the application, with Claims 5 and 17 being the independent claims. The title of the invention is allegedly not descriptive. The Information Disclosure Statement (IDS) filed July 12, 2004 allegedly fails to comply with 37 C.F.R. § 1.98(2). Claims 5 and 17 are rejected under 35 U.S.C. § 112, second paragraph, for allegedly having insufficient antecedent basis for certain recitations. Claims 5 and 17 are rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Badke (U.S. Patent No. 5,953,365). Claims 12 and 24 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Badke. Claims 10 and 22 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Badke in view of Marchok (U.S. Patent No. 6,771,590 B1).

Applicants appreciate the indication by the Examiner that Claims 6-9, 11, 18-21 and 23 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Applicants respectfully disagree with the Examiner regarding the title because the current title, **APPARATUS AND METHOD FOR TRANSMITTING/RECEIVING DIFFERENTIAL STBC USING CHANNEL POWER**, is clearly indicative of the invention to which the claims are directed. Applicants respectfully request the Examiner to explain with specificity why the current title is not clearly indicative of the invention to which the claims are directed.

The Examiner states, in item 4 on pages 2 and 3 of the Office Action, that the IDS filed July 12, 2004 (July 2004 IDS) fails to comply with 37 C.F.R. § 1.98(2) because, allegedly, a legible copy of the two articles cited in the July 2004 IDS was not provided. As a courtesy, Applicants have provided another copy of the two articles cited in the July 2004 IDS, another copy of the PTO 1449 form submitted with the July 2004 IDS, and respectfully request that the Examiner initial the articles listed in the "OTHER PRIOR ART" section of the PTO-1449 form

and provide an initialed copy the PTO-1449 form with the next communication to ensure that the prior art citations of the two articles have been duly considered.

The Examiner states that Badke discloses all of the recitations in Claims 5 and 17. Regarding Claims 12 and 24, the Examiner concedes that Badke does not specify the type of modulation used. The Examiner asserts that that it would have been obvious to use one of PSK and QAM in Badke. Regarding Claims 10 and 22, the Examiner concedes that Badke does not disclose the normalization value is calculated by dividing an autocorrelation value of a previously received signal by the estimated channel power and then taking a square root. The Examiner states that Marchok suggests these recitations and asserts that it would have been obvious to modify Badke with the alleged suggestions of Marchok.

Independent Claim 5 has been amended to recite, in part, a method for receiving information symbols encoded with a differential space-time block code (STBC) before being transmitted and decoding the received information symbols in a wireless communication system, the method including collecting a signal received at a reception antenna from a plurality of transmission antennas for a block duration; calculating a substitution signal by multiplying the signal received from the plurality of antennas by a signal received for a previous block duration; estimating channel power for a channel from the plurality of transmission antennas to the reception antenna; normalizing estimated channel power with a normalization value that is determined as a size of previously received symbols; and calculating information symbols by dividing the substitution signal by normalized channel power. Independent Claim 17 has also been amended in a similar manner.

Applicants respectfully submit that these amendments overcome the rejection of Claims 5 and 17 under 35 U.S.C. § 112, second paragraph.

Badke describes an interference-tolerant spread-spectrum receiver and method therefor. The Examiner relies on FIGS. 1, 3 and col. 1, lines 29-35, 43-45, 50-54, 59-61, col. 3,

lines 16-24, col. 4, lines 4-7, col. 5, lines 3-19, 32-42, col. 6, line 52, to col. 7, line 55, and col. 9, lines 16-62 for satisfying the recitations in Claims 5 and 17.

Badke shows a matched-filter spread-spectrum receiver 20 in FIG. 1 that includes a filter network 32 and a correlator/detector 34. The filter network 32 includes a first finite impulse response (FIR) filter 36', a second FIR filter 36", a pre-filter delay 38, a post-filter delay 52, and a summer/combiner 56. The correlator/detector 34 includes an absolute squarer 184, a one pole filter 192, a summing circuit 194, and a comparer 202.

A composite signal 22 is provided to the filter network 32 where the composite signal 22 is split into a first input signal 22' and a second input signal 22". The pre-filter delay 38 delays the second input signal 22" a predetermined time delay to produce a delayed second input signal 40. The first FIR filter 36' processes first input signal 22' and produces a first filtered signal 50'. The second FIR filter 36" processes the delayed second input signal 40 and produces a second filter signal 50". The post-filter delay 52 delays the first filtered signal 50 to produce a delayed first filtered signal 54.

The summer/combiner 56 recombines the delayed first filtered signal 54 and the second filtered 50 to produce an FIR filtered signal 58. The FIR filtered signal 58 is input to the correlator/detector 34 where the FIR filtered signal 58 is multiplied against itself to produce an absolute or magnitude signal 186. The one-pole filter 192 produces a dynamic bias 194 from the absolute signal 186 that is an ongoing average of the magnitude of the absolute signal 186. The summing circuit 194 sums the dynamic bias 194 with a predetermined static offset bias 198 to produce a comparison threshold 190. The comparator 202 compares the absolute signal 186 against the comparison threshold 190 to produce a binary detection signal 204. A determination is then made as to whether a signal correlation has been.

Badke fails to disclose the recitations of Claims 5 and 17 in the areas identified by the Examiner for at least the following reasons.

First, an apparatus and method for receiving according to the present invention have features of calculating a substitution signal by multiplying the received signal by a signal received from the plurality of antennas for a previous block duration, estimating channel power for each channel of the reception antennas, normalizing estimated channel power with a normalization value, and calculating information symbols by dividing the substitution signal by normalized channel power. A power estimator according to the present invention estimates channel power for channels of a plurality of transmission/reception antennas.

On the contrary, the weighting function 100 according to Badke displaces a first FIR filter 36 and a second FIR filter 36 by predetermined delay time 66, as shown in FIG. 4 and discussed in col. 5, lines 32-42. Thereby, the weighting function 100 of Badke causes time difference between the first windowed signal and the second windowed signal, and the signal energy lost in the FIR filter 36, as shown in FIG. 3, can be compensated.

Accordingly, the present invention estimates channel power for each channel of the reception antennas, whereas Badke compensates the signal energy according to the time difference. As such, the feature of estimating the channel power for the channel of the plurality of the antennas according to the present invention is different from Badke.

Second, the Examiner relies on FIG. 1, col. 1, lines 59-61, col. 3, lines 16-21, and col. 4, lines 4-7 of Badke for disclosing the recitation “receiver for receiving information symbols encoded with a differential space-time block code (STBC) before being transmitted and decoding the received information symbols in a wireless communication system, the receiver comprising: a delay group for delaying a signal received for a previous block duration”. These areas of Badke merely describe the use of a method for interference-tolerant reception of a spread spectrum signal including sampling the signal, transforming the signal to the frequency domain, limiting and disspreading the signal, and transforming the signal back to the time domain. Badke nowhere even discusses the use of STBC, much less receiving information symbols encoded with a differential STBC.

Third, the Examiner relies on FIGS. 1, 3 and col. 1, lines 29-35, col. 3, lines 22-24, and col. 4, lines 12-21 of Badke for disclosing the recitation “a symbol collector for collecting a signal received from a plurality of transmission antennas for a block duration”. These areas of Badke merely discuss conventional spread-spectrum reception techniques. As described above, the summer/combiner 56 of Badke merely recombines the delayed first filtered signal 54 and the second filtered 50 to produce an FIR filtered signal 58. The summer/combiner 56 of Badke fails to suggest the recited symbol collector because the summer/combiner 56 does not collect a signal received from a plurality of transmission antennas for a block duration.

Fourth, the Examiner relies on FIG. 3 and col. 5, lines 32-42 of Badke for disclosing the recitation “a multiplier group for outputting a substitution signal by multiplying the signal received from the plurality of antennas by the signal received for a previous block duration”. These areas of Badke merely discuss how a transformed signal 120 is produced within a plurality of frequency bins 122. Badke fails to suggest the recited multiplier group because the transformed signal 120 is not a substitution signal obtained by multiplying a received signal by a previously received signal.

Fifth, the Examiner relies on FIG. 1, col. 1, lines 50-54 and col. 5, lines 32-42 of Badke for disclosing the recitation “a power estimator for estimating channel power for a channel from the plurality of transmission antennas to the receiver, with the signal received from the plurality of antennas”. These areas of Badke merely describe the use of a weighting function and nowhere suggest a power estimator for estimating channel power for a channel from a plurality of transmission antennas, with a received signal.

Sixth, the Examiner relies on FIG. 3, and col. 6, lines 17-21 and col. 6, line 52, to col. 7, line 55 of Badke for disclosing the recitation “a normalizer for outputting normalized channel power by multiplying the estimated channel power by a normalization value that is determined as a size of the previously received symbols”. These areas of Badke merely describe various techniques of normalizing given datum and nowhere suggest multiplying an estimated channel power by a normalization value that is determined as a size of previously received symbols.

Seventh, the Examiner relies on FIG. 3 and col. 6, line 52, to col. 7, line 55 of Badke for disclosing the recitation “a divider for calculating information symbols by dividing the substitution signal by the normalized channel power”. These areas of Badke merely describe various techniques of normalizing given datum and nowhere suggest calculating information symbols by dividing a substitution signal by a normalized channel power.

Eighth, the Examiner relies on FIG. 1, col. 1, lines 43-45 and col. 9, lines 16-62 of Badke for disclosing the recitation “a detector for restoring an information sequence with the information symbols”. These areas of Badke merely describe processing in the correlator/detector 34 and nowhere suggest restoring an information sequence with information symbols.

For at least these reasons, the Examiner has failed to establish a *prima facie* case of anticipation based on Badke.


Marchok describes communication system clock synchronization techniques and fails to supplement the deficiencies of Badke.

Accordingly, amended Claims 5 and 17 are allowable over Badke, Marchok, or any combination thereof.

While not conceding the patentability of the dependent claims, *per se*, Claims 6-12 and 18-24 are also allowable for at least the above reasons.

Accordingly, all of the claims pending in the Application, namely, Claims 5-12 and 17-24, are in condition for allowance. Should the Examiner believe that a telephone conference or personal interview would facilitate resolution of any remaining matters, the Examiner may contact Applicants' attorney at the number given below.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Paul J. Farrell", written over the typed name.

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